

Math 2415

Homework on 14.6

1. Let $f(x, y) = x^2y^2 - x$.
 - (a) Find ∇f at $(2, 1)$.
 - (b) Find the directional derivative of f at $(2, 1)$ in the direction of $-\mathbf{i} + 3\mathbf{j}$.
2. Find the minimum rate of change of $f(x, y) = x^2 + y^2 - 3x + 6y$ at the point $(3, 5)$. In what direction does it occur?
3. Let $f(x, y) = \frac{1}{\sqrt{x^2+y^2}}$.
 - (a) Calculate the gradient of f .
 - (b) Find the direction in which f increases most rapidly at the point $(1, 1)$
 - (c) Find the direction in which f decreases most rapidly at the point $(2, 5)$
 - (d) In what directions is the rate of change of f equal to zero at the point $(1, 1)$?
4. Find the directional derivative of $f(x, y) = xy^2$ in the direction $\theta = \frac{\pi}{3}$ at the point $(2, 4)$.
5. Let $f(x, y) = xy$. Sketch the curve $f(x, y) = -4$ together with ∇f and the tangent line at the point $(2, -2)$. Find an equation for this tangent line.
6. Problem 3 from <http://mathquest.carroll.edu/libraries/MVC.student.14.04.pdf>
7. Problem 6 from <http://mathquest.carroll.edu/libraries/MVC.student.14.04.pdf>